

Review of Potential Exposure Pathways for Parcels Identified by the City of Tucson for Upcoming Development

PREPARED FOR: Arizona Department of Environmental Quality - Underground Storage Tank Division

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This memorandum summarizes an evaluation of potential exposure pathways associated with historical diesel fuel releases at the Union Pacific Railroad Company (UPRR) Passenger Depot Site (Site) in Tucson, Arizona. These pathways may be present at properties that have been identified by the City of Tucson (City) as planned for development within the next five years. This assessment was requested by the City in a letter dated December 26, 2012 (City of Tucson, 2012) and required by the Arizona Department of Environmental Quality (ADEQ) in a letter dated March 11, 2013 (ADEQ, 2013).

The assessment presented in this memorandum includes an evaluation only of impacts associated with historical releases of diesel fuel from the fueling facilities previously used at the Site. Releases of gasoline and chlorinated solvents by other parties are known to exist in the downtown Tucson area. As these releases are not the responsibility of UPRR, they are not evaluated in this memorandum. Selected sites in the area are shown on Figure 1 to provide the approximate locations of sites that may be of interest to property developers. Also shown on Figure 1 are thicknesses of light, nonaqueous phase liquid (LNAPL) measured in monitoring wells during November 2011.

Exposure Pathway Analysis

An exposure pathways analysis and screening risk evaluation was conducted during the remedial investigation of the site (Environmental Resources Management [ERM], 2000). Key points from that evaluation are summarized, and updated with more current site information where available, in the following points:

1. Petroleum hydrocarbon constituents in soil are confined to depth (greater than 50 feet below ground surface (bgs)) except in the immediate vicinity of the release point. This is substantiated by results from soil borings B-101 and SB-PD-3, which were installed within 25 feet of the former northwest fueling platform but did not contain detectable concentrations of total petroleum hydrocarbons in samples collected between one and 55 feet bgs (Figure 2). For reference, soil boring B-101 was installed on parcel 117-06-081G, which has been identified for development by the City. Soil borings located near the former southwest fueling facility also suggest that there was little lateral spreading of petroleum (ERM, 2000).

Some of the soil borings installed farther from the release points contained TPH in soil samples at depths ranging from 56.5 to 86 feet bgs (ERM, 2000). Soil at this depth would not be encountered during typical activities other than during excavation for, and construction of, deep subsurface structures such as caissons. Exposure to impacted materials by excavation workers would be temporary and could be mitigated through standard health and safety protocols.

2. The non-volatile nature of diesel fuel and the depth at which the free product occurs (60 to 90 feet bgs) suggests that the inhalation pathway is incomplete for residents and commercial or industrial workers. This is substantiated by the screening risk evaluation (ERM, 2000) which used soil gas data from two soil borings located near the release points and two soil borings located away from the release points to evaluate whether petroleum-related compounds were present in soil gas at concentrations above risk-

based screening levels. The evaluation concluded that no compounds exceeded risk-based screening levels. Because this evaluation used data from the release points and data from off-property, this assessment should be valid throughout the LNAPL-impacted area. Therefore, the inhalation pathway is considered to be incomplete for residents and commercial or industrial workers. Excavation workers may be exposed to soil vapor during construction of deep subsurface structures such as caissons or underground parking garages. Exposure to impacted materials by excavation workers would be temporary and could be mitigated through standard health and safety protocols.

3. No petroleum constituents have been detected in the regional aquifer during routine monitoring conducted since 2000. Also, although groundwater is used as a drinking water source in Tucson, there are no known active groundwater wells in the vicinity of the Site. Water is supplied to residences and businesses in the area by the City of Tucson. Therefore the exposure pathway from the regional aquifer is incomplete.
4. Petroleum constituents have been detected in the perched groundwater zone at a depth of 60 to 90 feet bgs. However, the only petroleum constituent that has been detected above the Aquifer Water Quality Standard is benzene, which has been associated with gasoline releases to the west and northwest of the diesel fuel release points, sources not related to UPRR activities. In addition, the perched groundwater is naturally nonpotable due to elevated concentrations of total dissolved solids, and there is no known use of the perched groundwater zone as a drinking water source. Drinking water in the area is provided by the City of Tucson. Therefore the exposure pathway from the perched groundwater zone is incomplete to residents and industrial or commercial workers. Excavation workers may come into contact with impacted groundwater during construction of deep subsurface structures such as caissons. Exposure to impacted materials by such workers would be temporary and could be mitigated through standard health and safety protocols.
5. Free product is present in the perched groundwater zone at a depth of about 60 to 90 feet bgs in an area surrounding the release points (Figure 1). Free product at this depth would not be encountered during typical activities other than during construction of deep subsurface structures such as caissons. Exposure to impacted materials by excavation workers would be temporary and could be mitigated through standard health and safety protocols.

The parcels that have been identified for development by the City of Tucson are shown on Figure 1 and listed in Table 1. Exposure pathways for residential, commercial or industrial worker were evaluated and determined to be incomplete. The only potentially complete exposure pathways are for the excavation worker. Inhalation, ingestion and dermal exposure to free product diesel and associated compounds in groundwater, soil, and soil vapor may occur during construction of deep (greater than 50 feet bgs) subsurface structures.

Summary

This evaluation has demonstrated that for the parcels identified for development, the only potentially complete exposure pathways to contaminants associated with historical diesel releases from the UPRR Passenger Depot Site are for excavation workers during construction of deep (greater than 50 feet bgs) subsurface structures such as caissons. Exposure to impacted materials by such workers would be temporary and could be mitigated through standard health and safety protocols. A plan to manage soil generated during excavation or drilling into deep soil should be developed prior to property development. Exposure to other contaminants that may be present due to releases unrelated to historical UPRR operations were not evaluated.

References

Arizona Department of Environmental Quality. 2013. Letter from Michael Harren and Sam Rogers to Gary Honeyman, Union Pacific Railroad Company RE: Corrective Action Plan Revision. March 11.

City of Tucson. 2012. Letter from Andrew Quigley to Gary Honeyman, Union Pacific Railroad Company RE: ADEQ Facilitated Meeting Between Union Pacific Railroad and City of Tucson Regarding Facility ID 0-008574 (LUST No. 3953). December 26.

Environmental Resources Management. 2000. Remedial Investigation Report, Passenger Depot Site, ADEQ VRP Facility #100149-00, Tucson, Arizona. December.

TABLE 1

Potential Receptors by Parcel*Union Pacific Railroad Company Passenger Depot Site, Tucson, Arizona*

Parcel	LNAPL Associated with Passenger Depot Site		Potential Impacts from Other Sources
	Present Beneath Parcel?	Potential Receptors	
11705068C	No	None	Benzene in groundwater from ADOT Site
11705068D	No	None	Benzene in groundwater from ADOT Site
11706097C	Yes	Excavation Worker ^{1,2}	
11706185B	Yes	Excavation Worker ^{1,2}	
11706083A	Yes	Excavation Worker ^{1,2}	Benzene in groundwater from unknown source
11706081G	Yes	Excavation Worker ^{1,2}	
11706117B	Unknown	Excavation Worker ^{1,2}	
117066950	Yes	Excavation Worker ^{1,2}	
117066940	Yes	Excavation Worker ^{1,2}	
11706168B	Unknown	Excavation Worker ^{1,2}	Diesel LNAPL from Trailways site
11706168C	Unknown	Excavation Worker ^{1,2}	Diesel LNAPL from Trailways site
11706168A	Unknown	Excavation Worker ^{1,2}	Diesel LNAPL from Trailways site
11706179A	Unknown	Excavation Worker ^{1,2}	Diesel LNAPL from Trailways site
117061740	Unknown	Excavation Worker ^{1,2}	Diesel LNAPL from Trailways site
117061780	Unknown	Excavation Worker ^{1,2}	Diesel LNAPL from Trailways site
11706177A	Unknown	Excavation Worker ^{1,2}	Diesel LNAPL from Trailways site
11706177B	Unknown	Excavation Worker ^{1,2}	Diesel LNAPL from Trailways site
11705069D	Yes	Excavation Worker ^{1,2}	VOCs in groundwater from 7th Street and Arizona Avenue Site (Oliver's Cleaners)
11705069C	Yes	Excavation Worker ^{1,2}	VOCs in groundwater from 7th Street and Arizona Avenue Site (Oliver's Cleaners)
117062000	Unknown	Excavation Worker ^{1,2}	
11706187D	Unknown	Excavation Worker ^{1,2}	
11706193B	Unknown	Excavation Worker ^{1,2}	
11706193C	Unknown	Excavation Worker ^{1,2}	
11706197A	Unknown	Excavation Worker ^{1,2}	
117050560	Yes	Excavation Worker ^{1,2}	VOCs in groundwater from 7th Street and Arizona Avenue Site (Oliver's Cleaners)
117050640	Yes	Excavation Worker ^{1,2}	VOCs in groundwater from 7th Street and Arizona Avenue Site (Oliver's Cleaners)
11706175A	Unknown	Excavation Worker ^{1,2}	Diesel LNAPL from Trailways site
117051000	No	None	

Notes:

UPRR = Union Pacific Railroad Company

LNAPL = light nonaqueous phase liquid

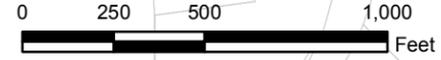
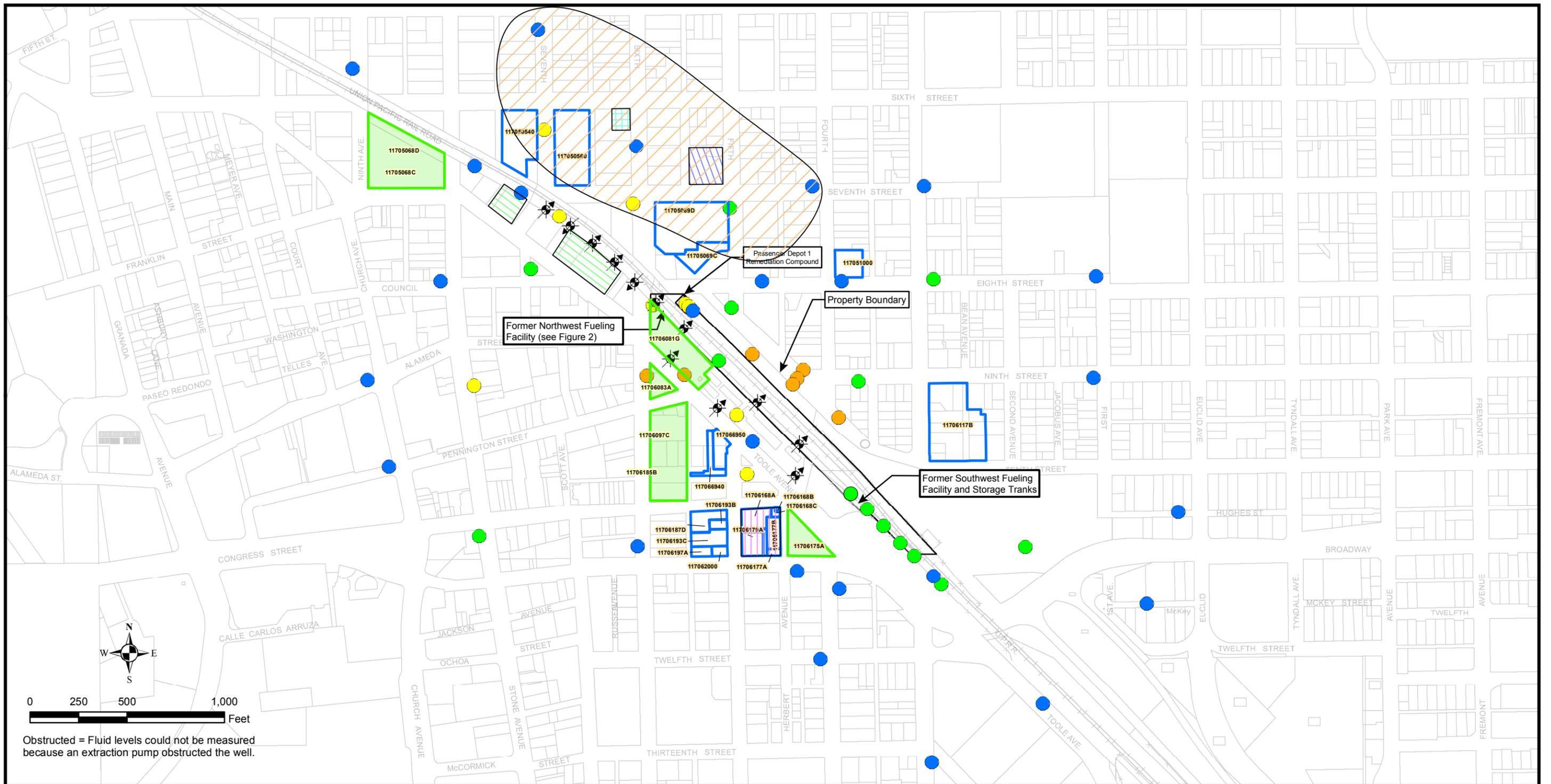
VOCs = volatile organic compounds

ADOT = Arizona Department of Transportation

¹ Excavation workers are defined as construction workers who work within excavations deep enough to encounter impacted materials (approximately 60 to 90 feet below ground surface) on a short-term basis during construction² The only potentially complete exposure pathways are ingestion, inhalation or dermal contact with diesel-impacted soil, groundwater, or free product located at a depth of 60 to 90 feet below ground surface

VOCs associated with diesel releases at the Passenger Depot Site are not present in the perched groundwater zone

Petroleum associated with diesel releases at the Passenger Depot Site is not known to be present in soil on any of the parcels evaluated



Obstructed = Fluid levels could not be measured because an extraction pump obstructed the well.

Legend

LNAPL_Thickness

- < 0.01 ft
- ≥ 0.01 to 1 ft
- ≥ 1 to 4 ft
- ≥ 4 ft
- 0.45 LNAPL Product Thickness (feet)

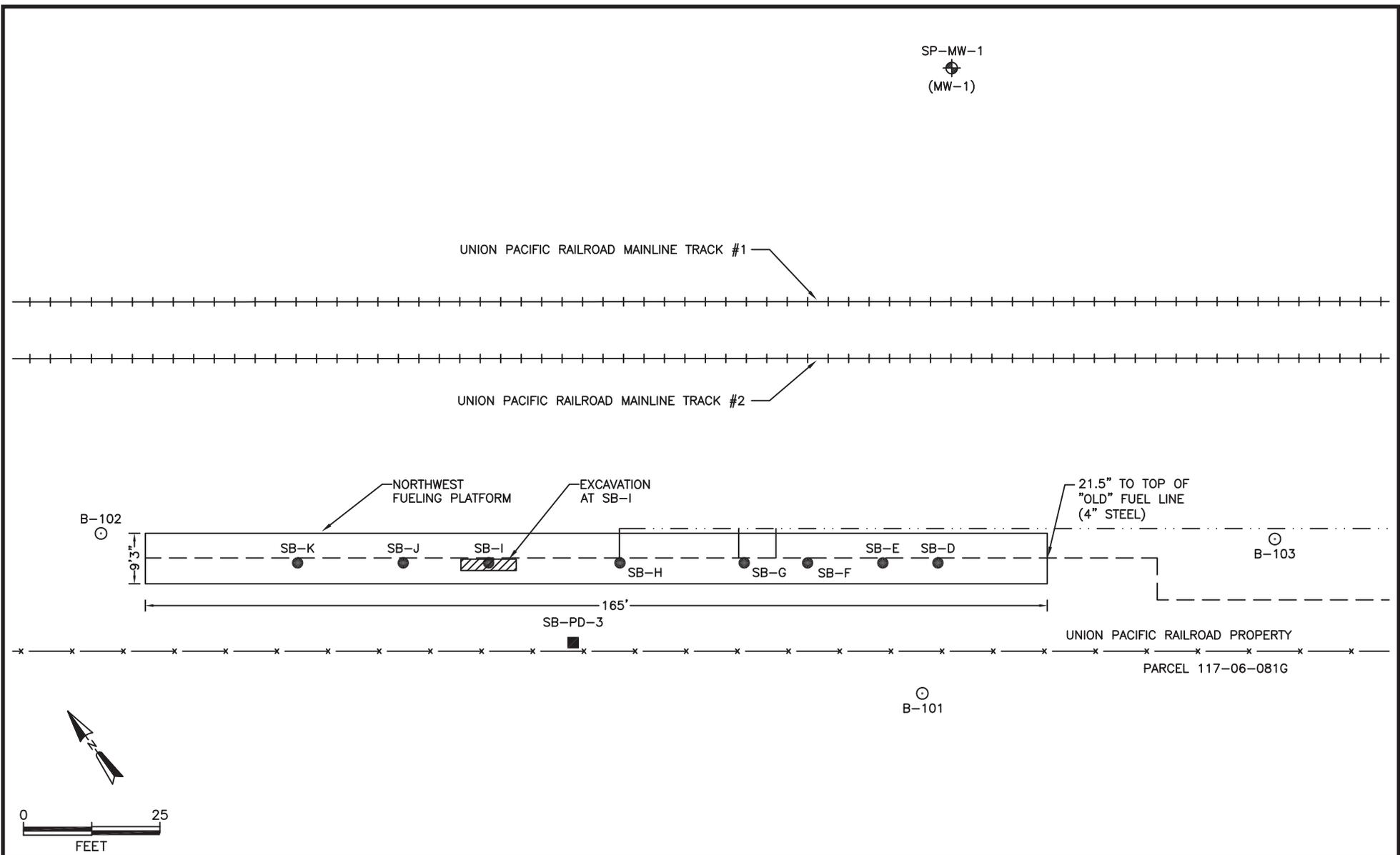
- ⊕ Perched Groundwater Zone Monitoring Well
- ⊕ Extraction Well
- ⊕ Injection Well
- ▭ Private Projects
- ▭ City of Tucson Projects

ADJACENT ENVIRONMENTAL SITES¹:

- ▭ Oliver's Cleaners – Dissolved PCE/TCE
- ▭ Yellow Cab – Dissolved BTEX
- ▭ Firestone – Dissolved BTEX
- ▭ ADOT – Dissolved BTEX
- ▭ Trailways Bus Station – Diesel LNAPL

¹ Exposure pathways associated with these sites are not evaluated in this memorandum.

**FIGURE 1
DOWNTOWN TUCSON PLANNED DEVELOPMENTS
JULY 2013**



LEGEND

- SOIL BORING LOCATION, 2006
- SOIL BORING LOCATION, 1998
- SOIL BORING LOCATION, 1991
- ⊕ MONITORING WELL LOCATION, 1991
- x — x — FENCE
- - - - - LOCATION OF "OLD" FUEL LINE
- · · · · LOCATION OF "NEW" FUEL LINE

FIGURE 2
SOIL BORINGS NEAR FORMER NORTHWEST FUELING PLATFORM

